

# Inter-agency Collaborations: Federal Agencies Work with Colleges and Universities to Offer Interdisciplinary Training in Remote Sensing, Ocean and Marine Science

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**Abstract** - A supportive, thriving intellectual climate is a prerequisite to innovation and progress in engineering and in limnological, marine, oceanic and atmospheric fields. These challenging fields require problem solving that crosses traditional disciplinary boundaries. Research shows that highly specialized undergraduate and graduate training programs often lack the broad fundamental skills necessary for multidisciplinary investigation. This is especially true for specialists in the science and management of fisheries ecosystems. This paper documents the results of the interagency collaboration to attract and retain students in engineering and limnological, ocean, marine and atmospheric-related science through postdoctoral levels, and to retrain individuals with experience in other disciplines for careers in these fields

## I. INTRODUCTION

More than a decade ago, NOAA's National Marine Fisheries Service initiated a significant change by joining with non-federal collaborators in a conference on the campus of Hampton University (Virginia) in an effort to increase minority involvement in the ocean and marine sciences (Jearld, 1996). The conference, *Expanding Opportunities in Ocean Sciences: Strengthening the Links between Historically Black and Minority Serving Colleges and Universities (HBMSCU) Undergraduate and Oceanic Graduate Studies*, was the catalyst for bringing together government agencies (NOAA, the National Science Foundation, the Environmental Protection Agency, and the Office of Naval Research) with faculty, students, and administrators from historically black and minority serving colleges and universities and

from graduate institutions with programs in the Ocean Sciences. The goal was to share ideas on topics ranging from preparing students for graduate study to expanding interagency collaboration.

Following the 1995 conference, the agency, and in particular the agency's Northeast Fisheries Science Center, has engaged in numerous directed collaborative activities with the broader academic community to train and educate a new pool of students. These efforts have resulted in new collaborations between research-intensive institutions and minority serving institutions, and an increase in the number of well qualified young people prepared for jobs in the ocean science, inside and outside the agency.

This paper documents the results of these interagency collaboration efforts to attract and retain students in engineering and limnological, ocean, marine and atmospheric-related science through postdoctoral levels, and to retrain individuals with experience in other disciplines for careers in these fields. In particular, this paper looks at how effective these collaborations, over the past ten years, have been in allowing NOAA to achieve its goals of a diverse scientific work force.

## II. RESULTS AND DISCUSSION

The need to develop all the nation's science and engineering talent demands a commitment that goes beyond policy and polemic. It will require a comprehensive and collaborative effort (Colwell, 2003). From a pure statistical standpoint, the total number of blacks and Hispanics receiving PhDs in the science, engineering, technical and

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mathematical (STEM) fields has decreased. At the same time, there has been an increase in the number of Asian Americans receiving these degrees. Overall, the total number of PhDs in the geosciences from 1973 to 2001 has remained relatively steady for all groups. The number of master's degree earners slightly increased through 1995; in 1996 there was a modest decrease and the number has remained steady since. The number of bachelor degrees dramatically increased from 1973 to 1985, followed by a steep decline from 1985 through 1990; levels rose slightly to 1995 and then decreased again until the present.

We are producing black, Latino and Native American scholars in the STEM fields; however they are being produced mostly at the big non-Research One universities (Hu-Dehart, 2004). Let's look at one example of this, again as reported in a presentation (Czujko, 2004) -- the 336 bachelor's degrees in the geosciences awarded to African-Americans 1996 – 2001 from all degree-granting departments. Forty-two from Hampton, 15 from Spelman, 14 from the US Naval Academy, 11 each from Elizabeth City State University and Jackson State University, 7 each from University of Oklahoma, Norman, CUNY City College, and Cleveland State University, and 5 from University of South Carolina at Carolina State.

It is crucial to note that almost 30% of the total (336) bachelors degrees earned in the geosciences over the five year period, 1996 – 2001 were awarded by degree-granting departments at HBCUs. The largest number, 42, was awarded by Hampton University, the site of the first expanding opportunities conference. Six out of the ten colleges listed have participated in the Expanding Opportunities Conferences. Savannah State (13) and Elizabeth City State University (11) attended the first NOAA Fisheries Service sponsored Expanding Opportunities Conference held at Hampton University (42). The other HBCUs -- Spelman College (15), Jackson State University (11) and South Carolina State University (5) -- have attended one or more of the follow-up Expanding Opportunities conferences sponsored by NOAA. Moreover, *all* of the HBCU institutions (except Spelman College) which have produced the greatest number of bachelor's degrees by geoscience degree-grating departments, are or have been closely involved with and supported from their inception by NOAA. All of the institutions have been supported through grants, contracts, Memoranda of Understanding

(MOU)s, Memoranda of Agreement and internship opportunities for post secondary graduates at all degree levels by other Federal Agencies including NASA, EPA, ONR and NSF.

It should also be noted that the HBCUs granting the largest number of geoscientists with bachelor's degrees are located in states with the highest population of African Americans. These southern states are also where over 99% of HBCUs are located (Czujko, 2004).

The plight and experience of Hispanics earning bachelor's degrees in the geosciences has been similar to that of African-Americans. Of the 618 bachelor's degrees earned by Hispanics in the geosciences, from all degree-granting departments across the country, most were from departments in universities located in the southwest US (Texas, New Mexico, Arizona, Nevada, and California). The University of Puerto Rico – Mayaguez granted the most bachelor's degrees in geosciences to Hispanics, producing a total of 58 over the five-year period, 1996 – 2005. Interestingly, the US Naval Academy was second, with 29 degrees awarded to over the same period.

The numbers are small but not non-existent, and it is worthwhile to note again the involvement NOAA has had in supporting many of these degree granting institutions. As Nancy Foster indicated at an early expanding opportunities conference, while the agency may not have been successful in increasing the number of hires it may have been successful in increasing the pool of potentials to hire from. She also said..."in my agency, the NMFS, we have experienced a new commitment to diversity. "It's absolutely true that nothing in the world is more effective in making a change in the way we do business than the personal commitment of people who are in positions to make decisions about the way we do business....I hope that when we leave this conference we will be able to look back and say that this was one of those rare meetings that actually made a difference."

Why it is then, with this commitment to diversity, with a commitment to expanding the pool from which NOAA hires, that NOAA has not achieved a meaningful level of diversity?

To answer this, we need to look back to the mid to late 1960's and 1970's which provide a model of success for hiring fairly large numbers of women and minorities for the first time in jobs other than clerical positions.

According to an unpublished internal report (by Dr. Brad Brown), prior to the

establishment of NOAA in 1970, there was little activity or emphasis with regard to equal employment opportunity in its predecessors. The number of minority employees was extremely small. A generalized statement out of Washington supported equal employment opportunity but little effective planning took place. And although women had begun to go to sea in the mid 1960's, none had served as chief scientist.

Three years into the formation of NOAA (1973), four new training programs were instituted that would change the face of NOAA in a dramatic and compelling way. They were known as the NOAA Scientific Upward Mobility Training Programs (SUMTP).

While the SUMTP was intended for all NOAA employees as well as candidates for employment, the motivation was to increase the professional and technical employment of women and people of color. NOAA had decided that the best course of action was to "grow our own" scientists and technicians. Of the four programs, two were directed at the technician (sub-baccalaureate) level and two at the professional scientist level (at least a four-year degree). All four programs were centrally administered and NOAA provided central funding for employees enrolled. Usually NOAA committed to bear the costs for a one-year period but in some cases they extended up to three years. Each Line Office's (e.g. National Marine Fisheries Service, National Weather Service, etc.) contribution to the program was to be on-the-job development and training as well as the assurance to retain the trainee at the successful completion of training.

Space does not allow for a full description of any of these programs. What is vital to note is that these programs, particularly the Graduate Scientist Program, became models for successful development, models that we have not seen for over ten years. Not only were women and people of color trained but they were guaranteed employment.

This seems to be where our current system breaks down. While we might be doing a decent job of supporting educational advancement in the scientific fields, our current EPP model is insufficient to change the demographics of the agency even to parity levels, not to mention exceeding levels on minority strength in the general workforce.

### III. RECOMMENDATIONS

A gulf still separates minority and majority participation in scientific fields which NOAA depends on to meet its mission and honor the public trust (Jearld, 1999). This gulf also exists within other agencies. How can we change this?

- We need to clarify the link to employment for higher education programs supported by federal agencies. For example, a program or an institution may get an (MOU) or funding to train students that include internship opportunities at NOAA. But there is no defined connection after that step. To ensure a healthy collaboration, agencies need to move away from merely employing internships without any commonly defined mission, structure or planning effort.
- We need to examine if there are unconscious biases during the application process. Are we perhaps valuing degrees from major research universities more than we do those from HBCUs?
- We need to consider if we are unwittingly constructing a two-tiered system that values diversity in internships (Hayden, 2004), temporary research positions, and the like, while reinforcing the status quo in permanent employment. In other words, if there is a tendency for the agency to cultivate a "farm team system" through internship appointments which includes appointment of minorities, which precludes them from being hired into permanent positions at the same rate as non-minorities?
- We need to actively identify, support, and learn from programs that have added to the professional workforce. Ben Cuker's ASLO Minorities Program, Hampton University, <http://www.hamptonu.edu/science/ASLO.htm>; Brian Bingham's Minorities in Marine Science Undergraduate Program (MIMSUP <http://www.wvu.edu/~mimsup>); Linda Hayden's Center of Excellence in Remote Sensing Education and Research, ECSU, <http://cerser.ecsu.edu/>; Paulinus Chigbu's NOAA-JSU Program in Fisheries Stock Assessment, MS <http://ccaix.jsums.edu/~marine/info.html>; Carlos Robles' CEA-CREST Programs, <http://cea-crest.calstatela.edu>; and Matt Gilligan's Collaboration to Integrate Research and Education (CIRE) Program, <http://www.savstate.edu/scitech/MarineSci/>

[MBL.html](#) are already running such programs.

- We need to replace people who are leaving. But to reach parity, we need to bring more minorities and women in than the number of those leaving.
- We need to set up a mechanism to draw from existing opportunities (e.g., internships) to build workforce.
- Finally, we need to look at the entire hiring process to understand who gets hired and how.

Let us return to collaboration. How can collaboration help us achieve the changes outlined above?

We need to return to the true definition of a collaborative relationship. A relationship that has mutual goals, a jointly developed structure and shared responsibility, mutual authority and accountability for success, and sharing of resources and rewards, <http://www.hdcs.fullerton.edu>. In short, we need a collaboration in which working together accomplishes something that cannot be accomplished alone. No where is this more critical than in changing the culture of an agency in terms of diversity. We have current, effective, partnerships with universities that are changing the rate of graduation for minorities overall, as well as within the agency's fields of interest. The partnership with Elizabeth City State University is a prime example. What we do not have yet, and what we need if we are ever to achieve parity, is a clear relationship between training and employment. The collaboration we need to develop now, in addition to continuing our work in expanding opportunities, is to collaborate within the NOAA structure to allow for the training, hiring, and advancement of women and minorities. We need a current version of NOAA (SUMTP). Only by creating a true collaboration between training and employment can NOAA reach its goal of achieving meaningful diversity and reflecting, more accurately, the face of America in the twenty-first century.

## REFERENCES and NOTES

- [1] Colwell, R. 2004. (Opening remarks), National Science Board Workshop --- Broadening Participation in Science and Engineering Research and Education: Workshop Proceedings, August 12, 2003; NSB 04-72.
- [2] Czujko, R. 2004. (Presentation and additional data), Painting by the Numbers Representation of Minorities in the Geosciences AGU, San Francisco, Dec. 16, 2004
- [3] Hayden, L., Broadening Participation in Science and Engineering, 2005, National Science Foundation HRD/Joint Annual Meeting, April 25- 26, 2005 Washington, DC
- [4] Hayden, L., Walter, D., Porter, W. 2004. Identifying an Important Source of Talented Students from Underrepresented Communities Through Effective Partnerships with Minority Serving Institutions, American Geophysical Union's (AGU) Fall Meeting, December 13-17, 2004 San Francisco
- [5] Hayden, L , Harrison, K. Mentoring Minority Undergraduates Through Remote Sensing and Geo-Information Science Research, African Association of Remote Sensing of the Environment (AARSE) 2004 bi-annual conferences, Oct. 18-21, 2004 Nairobi Kenya.
- [6] Hu-Dehart, E. 2004. Broadening Participation in Science and Engineering Research and Education: Workshop Proceedings, August 12, 2003; NSB 04-72
- [7] Jearld, A., Jr., 1996. (compiler and editor) Expanding Opportunities in Ocean Sciences: Strengthening the Links Between HBMSU Undergraduates and Oceanic Graduate Studies – Proceedings of a Conference: 11-12 September 1995, Hampton University, Hampton, VA. /Northeast Fish. Sci. Cent. Ref. Doc. /96-08; 119 pp. Available from: National Marine Fisheries Service, 166 Water St., Woods Hole, MA 02543-1026.
- [8] Jearld, A., Jr., 1999. (compiler and editor) Expanding Opportunities in Oceanic and Atmospheric Sciences: Proceedings of a Conference to Strengthen Linkages Among HBMSUs, NOAA, and Graduate Studies in Marine and Atmospheric Sciences, March 29-31, 1999, Richard A. Henson Center, University of Maryland Eastern Shore, Princess Anne, MD /Northeast Fish. Sci. Cent. Ref. Doc. /99-18; 147 pp. Available from: National Marine Fisheries Service, 166 Water St., Woods Hole, MA 02543-1026.